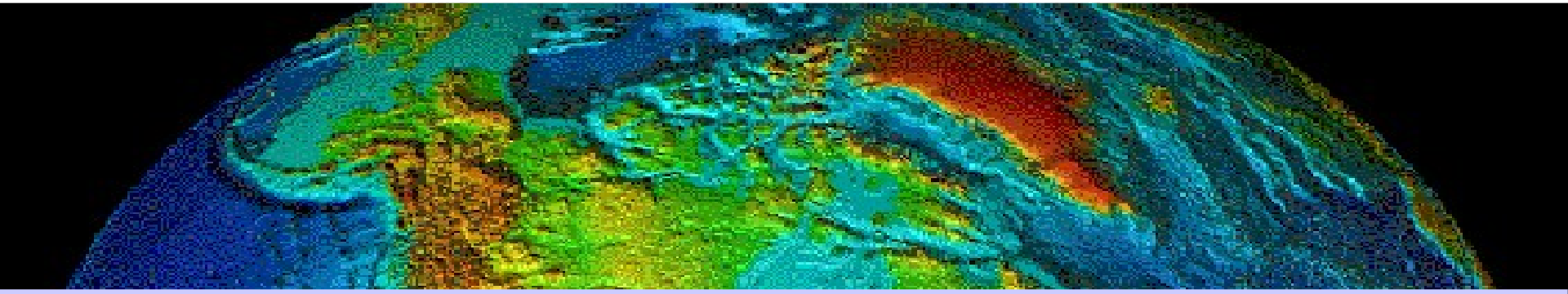
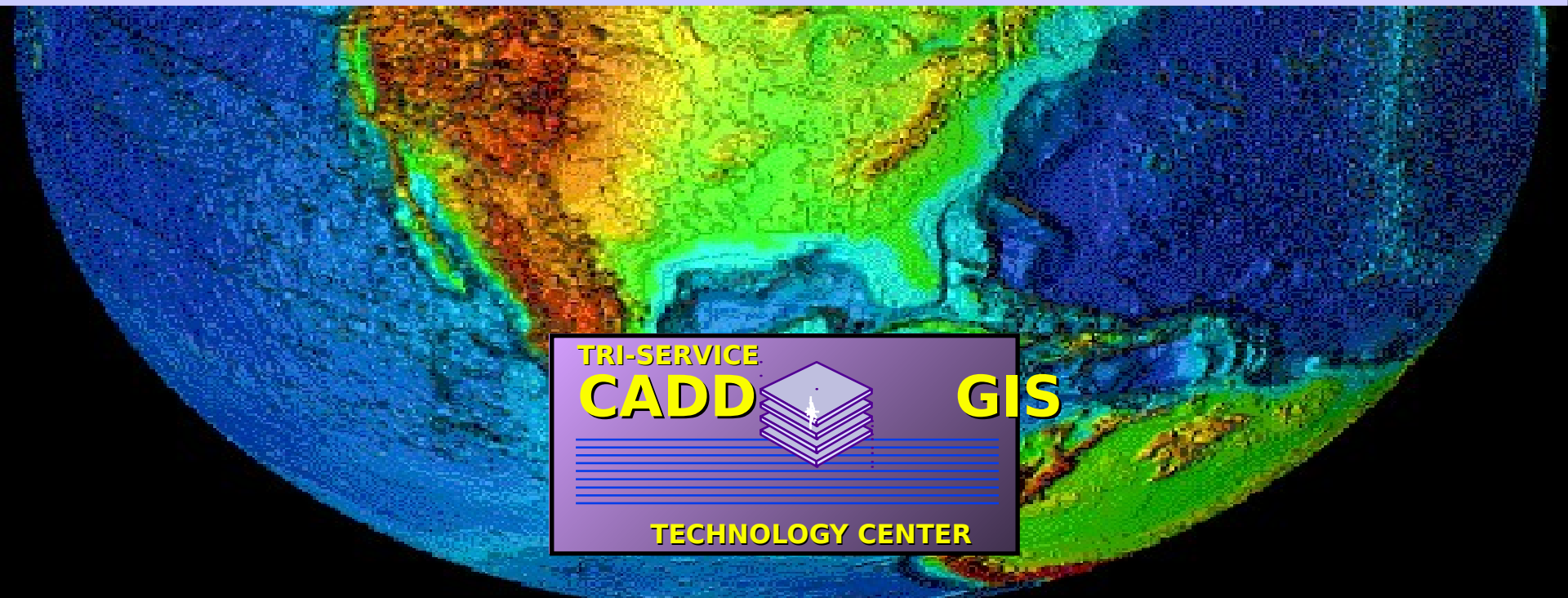
Center's Internet Web Page URL Address:
http://tsc.wes.army.mil



Tri-Service Facility Management Standards (TSFMS) Development Update

April 7 - 8, 1999



TSSDS/TSFMS E-mail Comments Database

Total of 117 E-mail comments/requests recorded from October 1, 1998 through March 26, 1999

Number by Customer Type:

- DoD - 43
- Commercial - 60
- Other Federal Government - 2
- Foreign Organization - 2
- University - 6
- Local Government - 3
- State Government - 0
- Utility Company - 1

Number by Comment Type:

- Software Problem - 12
- CD Request - 61
- Change Request - 1
- Other - 2
- Download Problem - 6
- Question - 33

TSSDS Internet WebSite Access/Download Database

Total of 522 unique WebSite Access/Download records recorded through
April 6, 1999

Number by Customer Type:

- Undesignated - 481
- DoD/Air Force - 4
- DoD/Army - 1
- DoD/USACE - 9
- DoD/Marines - 1
- DoD/Navy - 2
- NASA - 6
- National Guard - 6
- County Government - 1
- Commercial - 11

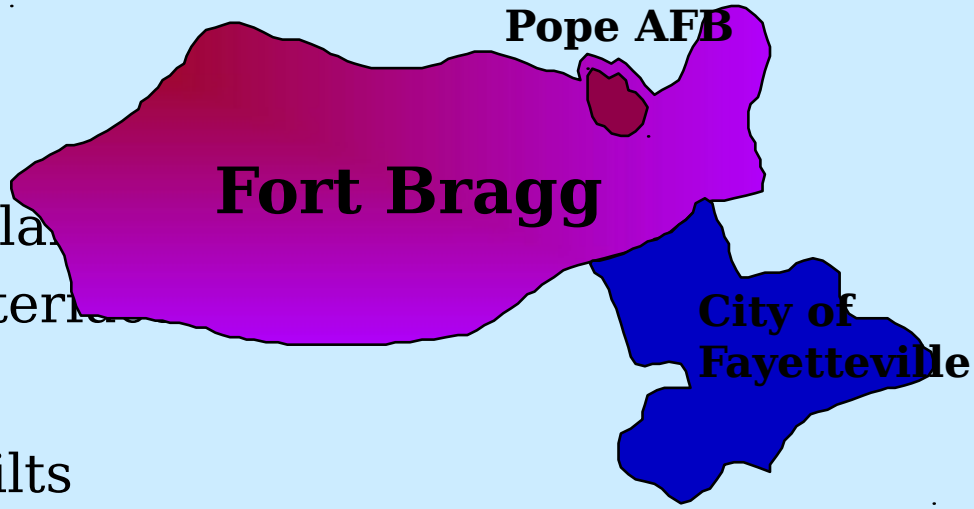
Tri-Service Spatial Data and Facility Management Standards Benefits

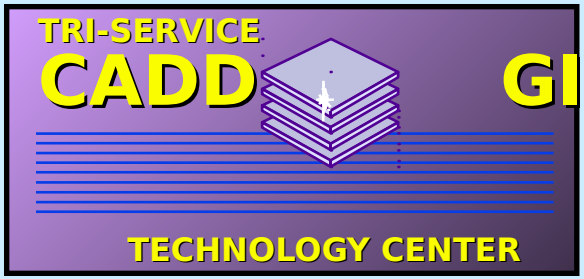
Why do We Need GIS and FM Standards?

- Permits Development of Standardized GIS and FM Data Collection Tools.
- Permits the Development of Standardized Training Tools & Courses.
- Provides Common GIS and FM Workflows for All Services.
- Permits Standardization of GIS and FM Implementation Procedures and Requirements
- Provides a Standard Data Model which Permits Sharing of Data
- Provides a Standard Data Model which Permits Commercial Software Vendors to Develop Applications.
- Provides a Stable, Nonproprietary, Database Structure which Protects Data Investment in a Rapidly Changing

Tri-Service Spatial Data and Facility Management Standards Benefits

- **Community Interchange**
  - **Fort Bragg**
    - Pope AFB Assets
    - BRAC and Mobilization Pla
    - Utilities and Drainage Interf
  - **Pope Air Force Base**
    - Site Drawings and As-Builts
  - **City of Fayetteville**
    - Hurricane Evacuation Plan
    - Cadastral Data and Demography
    - Utilities and Drainage Interface





Balanced Scorecard Approach Applied to Tri-Service Center Projects - FY98 Study Conclusions

1. Benefits of FY98 Tri-Service CADD/GIS Technology Center programs far exceed the estimated total cost.

2. The margin of benefits over cost is so great as to allow for a high degree of estimating uncertainty and implementation cost risk without jeopardizing the minimum economic justification of the program.

3. Of the projects for which quantitative measures of the return on investment could be postulated, all but two exceed the minimum threshold criterion with a wide margin for error and cost risk.

4. Exceeds federal and DoD policy guidance for the implementation of capital projects whether viewed strictly as Information Technology (IT) or as an IT related capital project subject to more generally applied economic threshold criteria.

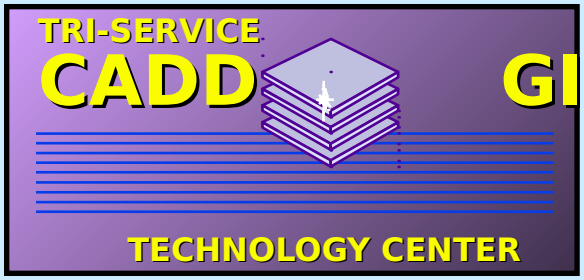
Part 3: Tri-Service Spatial Data Standards (TSSDS)

- Provides a standard graphic and nongraphic (database) format and structure for GIS implementations at Air Force, Army, and Navy (including Marines) installations and Army Corps of Engineers Civil Works activities.

- Provides a De Facto GIS standard for use by other Federal, State, and Local Government organizations, public utilities; and private industry.
- Provides a “nonproprietary” standard designed for use with commercially available “off-the-shelf” GIS and relational database software.
- Provides a GIS implementation schema for approved FGDC and DISA geospatial related data standards.
- Provides a grouping of geographically referenced (geospatial) features (i.e., “real-world” features depicted graphically on a map at their “real-world” location (coordinate). Each geospatial feature has an “attached” Attribute Table containing pertinent data about the geospatial feature.
- Release 1.4 of the TSSDS was published in August 1996. Release 1.6 was published in November 1996. Releases 1.7, 1.75, and 1.80 were published in August 1997, January 1998, and February 1999, respectively.

Part 4: Tri-Service Facility Management Standards (TSFMS)

- Provides a standard database format and structure for “business” and event data (e.g., inspections, repairs) related to TSSDS geospatial features and/or A/E/C CADD objects, specifically for CADD/GIS implementations at Air Force, Army, and Navy (including Marines) installations and Army Corps of Engineers Civil Works activities.
- Provides a De Facto FM standard for use by other Federal, State, and Local Government organizations, public utilities; and private industry.
- Provides a “nonproprietary” standard designed for use with commercially available “off-the-shelf” CADD, GIS, FM, and relational database software.
- Provides an implementation schema for approved DISA “business” related data standards.
- Provides a grouping of related attribute tables containing “business and event data.
- The first release of the TSFMS is included in the TSSDS/TSFMS Release 1.80, published in February 1999.



Tri-Service Spatial Data and Facility Management Standards Design Considerations

- Must be compatible with Commercially Available CADD, GIS, and Relational Database Software used by the Tri-Services (i.e., must be usable without software customization).
- GIS and CADD Software include:
  - ESRI ARC/INFO - Bentley MicroStation - ESRI ArcView
  - Intergraph MGE - AutoDesk AutoCAD - Intergraph GeoMedia
  - Bentley GeoGraphics - AutoDesk Map - AutoDesk World
- Relational Database Software includes:
  - ANSI Standard Structured Query Language (SQL)
  - Informix SQL - Access - Oracle SQL
- Operating Systems include:
  - UNIX
  - DOS & Windows 3.1 (will discontinue support after FY99)
  - Windows 95, 98, and NT (Primary emphasis)

TRI-SERVICE CADD GIS TECHNOLOGY CENTER

Tri-Service Spatial Data Standards (TSSDS)

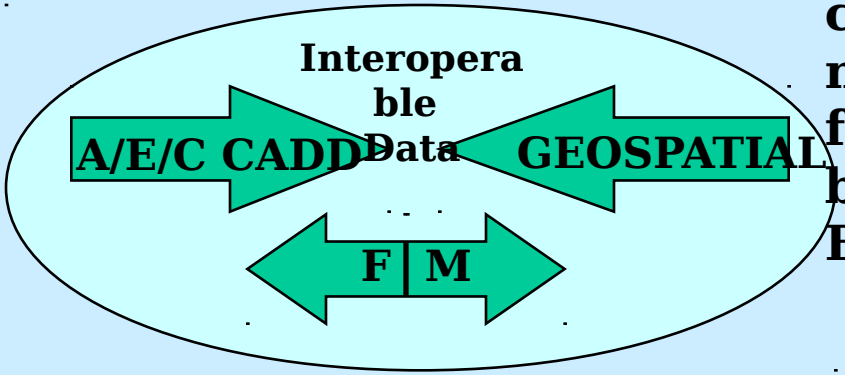
Applies to the Use of GIS and Geospatial Data Systems (GDS) to depict the geographic location and characteristics of natural or constructed features and boundaries on the Earth.

GIS
Cultural & Natural Resour
Planning
Mapping

Tri-Service A/E/C CADD Standards (A/E/C CADD Standards)

Applies to the Use of CADD for Design and Construction Activities.

Architectural
Design
Engineering
Design
Construction



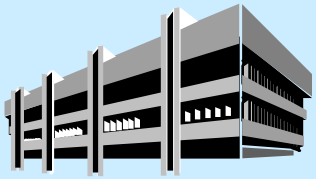
Tri-Service Facility Management Standards (TSF

Applies to the Use of CADD (with attached Database) and/or GIS/GDS for Project & Installation Life-Cycle Management. Provide Integration and Interoperability between the TSSDS, A/E/C CADD Standards, and Information Management Systems.

Utilities Management
Building Management
Space Management
Grounds & Range

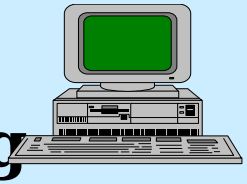
Environmental Restoration/Compliance
Real Estate & Leased Areas Management
Improvements Management (e.g., roads, sidewalks).

PROJECT LIFE-CYCLE DATA MODEL



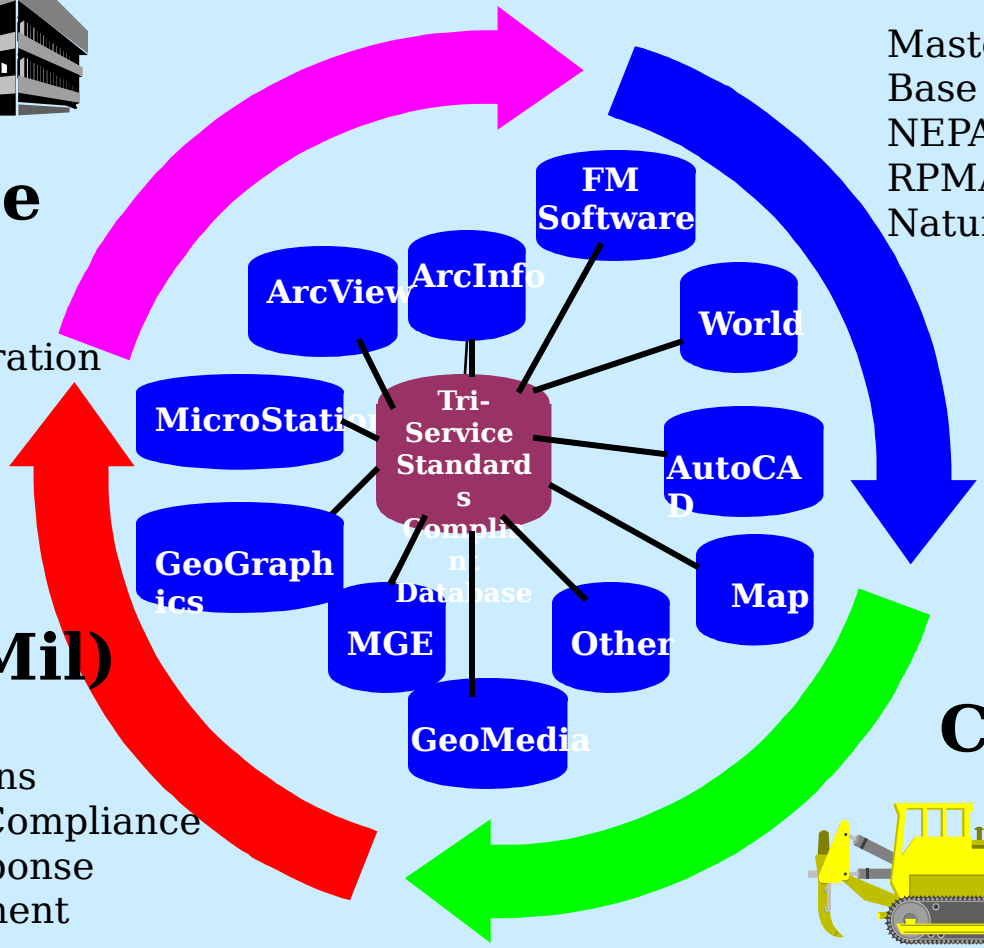
Maintenance

AIS
Work Orders
Installation Restoration



Planning

Master Plans
Base Closure
NEPA Reports
RPMA
Natural/Cultural Resources



Design

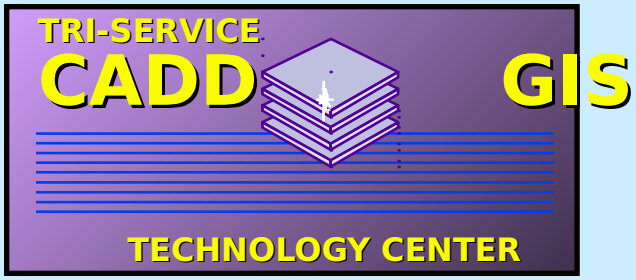
Plans &
Specifications

Operations (Base/Mil)

ISR
Mobilization Plans
Environmental Compliance
Emergency Response
Range Management

Construction

As-Builts
Shop Dwgs



Tri-Service Spatial Data and Facility Management Standards Application

- Interactive Spatial Data Standards Application
  - Self-contained Microsoft Visual Basic (32 bit) Application for Windows 95, 98, and NT. (Windows 3.1, 16 bit application, developed using Microsoft Access “Run-Time”).
  - Runs on Windows 3.1, 95, 98, or NT Personal Computer
  - No Additional Software Required
  - Distributed on CD-ROM
  - A “Living Application”; Versioning
  - Release 1.8 completed in February 1999.
  - Most current Version also available for download from Tri-Service CADD/GIS Technology Center Internet Web Site (http://tsc.wes.army.mil).

TSSDS/TSFMS

- TSSDS/TSFMS, Release 1.80 -
  - Published on CD-ROM with a downloadable digital version placed on Tri-Service Center's Internet Web Site.
  - Continued improvement of Interactive TSSDS Windows Application, focusing on "User-Friendly" changes.
    - Expanded capability to do queries by "Alias" name and "Keyword" search.
    - Introduce the capability to filter and print TSSDS components by activity (e.g., REEGIS, environmental restoration, environmental compliance,etc.).
    - Developed "Common" (Long) Names for Attribute Tables and Attributes.
    - Developed Toolbox to assist customers in upgrading to current TSSDS/TSFMS release.
  - Data Standards Additions include:
    - 1 new Entity Set (Ecology)
    - 47 New Entity Classes (41 of which were new FM Classes)
    - 138 New Entity Types
    - 120 New Attribute Tables with 4,564 new attributes.

How Are the Tri-Service Spatial Data and Facility Management Standards Developed?

- **Focus on Customer Comments & EWG, FTAG, FWG, and Task Group Requests.**
- **Individual Customer Comments and Requests are Researched and Incorporated into Next or Future TSSDS/TSFMS Release.**
- **Larger initiatives (e.g., development of Space Management Data Standards) require additional steps.**
  - **Identify and gather target sources of data standards (e.g. DoD, Commercial).**
  - **Research and Develop correlation matrices.**
  - **Develop recommended format for incorporation into TSSDS and/or TSFMS.**
  - **Perform data modeling as needed.**
  - **Solicit reviews and comments.**
  - **Make changes based upon comments and further evaluation.**
  - **Incorporate data standards into TSSDS/TSFMS standards database.**
- **Perform QA/QC analysis and develop physical data models.**
- **Test software (Browser, Generator, etc.).**
- **Make Master CD.**
- **Produce and Distribute CDs.**

FY98 TSFMS Task Group Meeting

March 10 - 11 1998

Patuxent River Naval Air Station, Maryland

- Two Options for Development and Integration of the TSFMS with the TSSDS and A/E/C CADD Standards were discussed:
  - 1. Incorporate TSFMS within Appropriate Entity Set of Using TSSDS Data Model.
  - 2. Develop TSFMS as Separate Entity Sets (or FM Sets).

- Option 1 was chosen and the TSSDS/TSFMS Release 1.80 was developed based upon this concept.

FY98 TSFMS Task Group Meeting

March 10 - 11 1998

Patuxent River Naval Air Station, Maryland

- **FY98 - FY99 Emphasis:**
  - **Space Management - Ongoing Delivery Order contract with BTG, Delta Research**
  - **Work Items Entity Set - Was under development at PAX.**
  - **Range and Training - Incorporated data standards from Army MAGIC, ITAM, & RSMIS Programs; Edwards AFB; and other sources into the TSSDS/TSFMS Release 1.80.**
  - **Environmental Compliance - Incorporated approved DISA DDDS, EPA, DESCIM data standards into TSSDS/TSFMS Release 1.80. Update in FY99.**
- **FY99 - FY2000 Emphasis:**
  - **Land Management - Postponed due to reduced TSFMS FY99 funding and increased emphasis on Communications and USACE Operations.**
  - **Utilities Management - Scheduled to begin in 4th Qtr. FY99**
  - **Structures Management - Postponed due to reduced TSFMS FY99 funding**
  - **Emergency Preparedness/Response - Postponed due to reduced TSFMS FY99 funding**
  - **Building Management - Postponed due to reduced TSFMS FY99 funding and completion of A/E/C attribute tables.**
  - **Communications Management - FY98 Effort Completed. AF requested that incorporation into TSSDS/TSFMS be postponed until after an AF Communications Meeting.**

FY98 TSFMS Task Group Meeting

March 10 - 11 1998

Patuxent River Naval Air Station, Maryland

- **Future Development:**
  - **International Considerations - (NATO, etc.)**
  - **Agreements - Interlocal, memorandums of understanding, etc.**
  - **Asset Management -**
  - **Grounds -**
  - **Health/Safety -**
  - **Security/Fire Protection -**
  - **Military Preparedness**
  - **Navigational Aids**
  - **Airfields/Piers/Transportation Infrastructure**
  - **Flood Plain Management**
  - **Signage**

FY99 TSFMS Development

- **Component 1** - TSFMS Task Group Meeting
- **Component 2** - TSFMS Reporting, Coordination, and Customer Service
- **Component 3** - Develop and Update TSFMS Technical Content
- **Component 4** - Develop and Update IDEF Models
- **Component 5** - Develop and Distribute Integrated TSSDS/TSFMS Release

FY99 TSFMS Development

- **Component 1 - TSFMS Task Group Meeting -**
  - Conduct 1 meeting. POC - Bobby Carpenter
- **Component 2 - TSFMS Reporting, Coordination, and Customer Service -**
  - **Similar to TSSDS effort. POC - Bobby Carpenter**

FY99 TSFMS Development

- **Component 3 - Develop and Update TSFMS Technical Content -**
  - Incorporate Communications CADD/GIS FM Standards (based upon DLA funded study). POC - Denise Bullock. EMA to incorporate FY98 study into Release 1.9.
  - Begin development of Real Estate/Parcel CADD/GIS FM Data Standards. Postponed to FY 2000.
  - Begin development of Utilities CADD/GIS FM Data Standards. POC - Bobby Carpenter
  - Review DISA DDDS Integration in TSFMS. POC - Chip Fleming.
  - Update Environmental Compliance/Restoration CADD/GIS FM Standards. POC - Bobby Carpenter
  - Complete development of Space Management CADD/GIS FM Standards. POC - Bobby Carpenter. Delta Research performing research.

FY99 TSFMS Development

- **Component 4 - Develop and Update IDEF Models.** POC - Chip Fleming

- **Component 5 - Develop and Distribute Integrated TSSDS/TSFMS Release.** POC - Bobby Carpenter
  - Complete Release 1.8
  - Update TSSDS/TSFMS Application.
  - Input approved TSSDS/TSFMS Release 1.9 data standards into database, perform QA/QC testing.
  - Review & Test TSSDS Release 1.9.
  - Develop & Produce TSSDS Release 1.9 CDs
  - Install TSSDS Release 1.9 on Internet Web Site.
  - Distribute TSSDS Release 1.9.

FY99 TSSDS Development Also Contributing to TSFMS Standards

- **Flora Entity Set Expansion**
- **Fauna Entity Set Expansion**
- **Cultural Entity Set Expansion**
- **Civil Works**
- **Military Range and Training**

TSSDS/TSFMS Data Model Organization

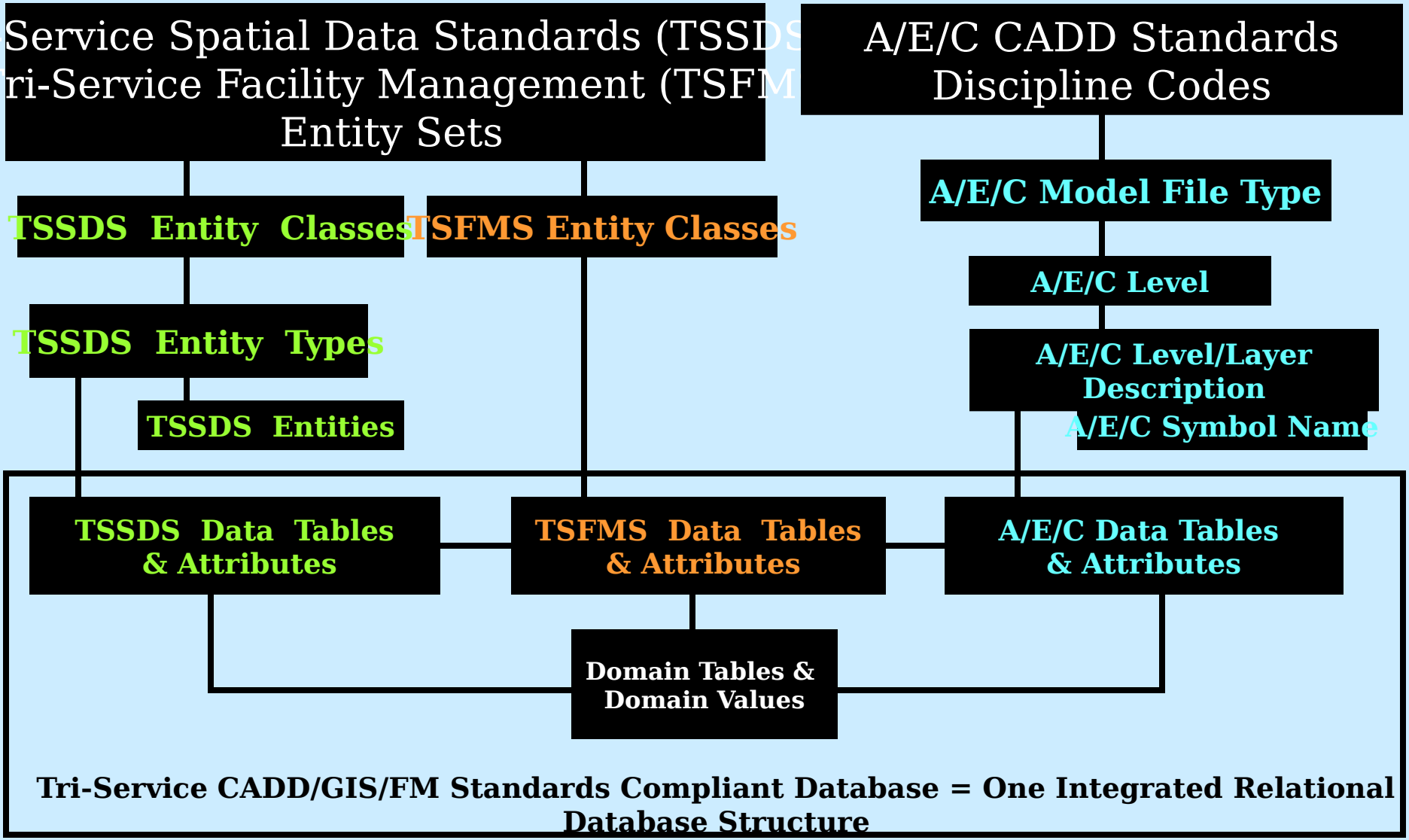
- **Entity Sets -**
  - Broad grouping for data management purposes.
- **Entity Classes -**
  - Grouping of data within each Entity Set for Data Management Purposes.
- **Entity Types -**
  - Grouping of TSSDS Geospatial Features (i.e., items that appear graphically on a map or drawing). Grouped within each Entity Class.
  - **Entities -**
    - Items that appear graphically on a map or drawing. Grouped within each Entity Type. Each Entity Type may have one or more Entities.
- **Attribute Tables -**
  - Relational database tables containing attribute data. Grouped within each Entity Class.
- **Domain Tables -**
  - Contains lists of “valid” or “permissible” values for specific attributes in an Attribute Table.

TSSDS/TSFMS Entity Sets

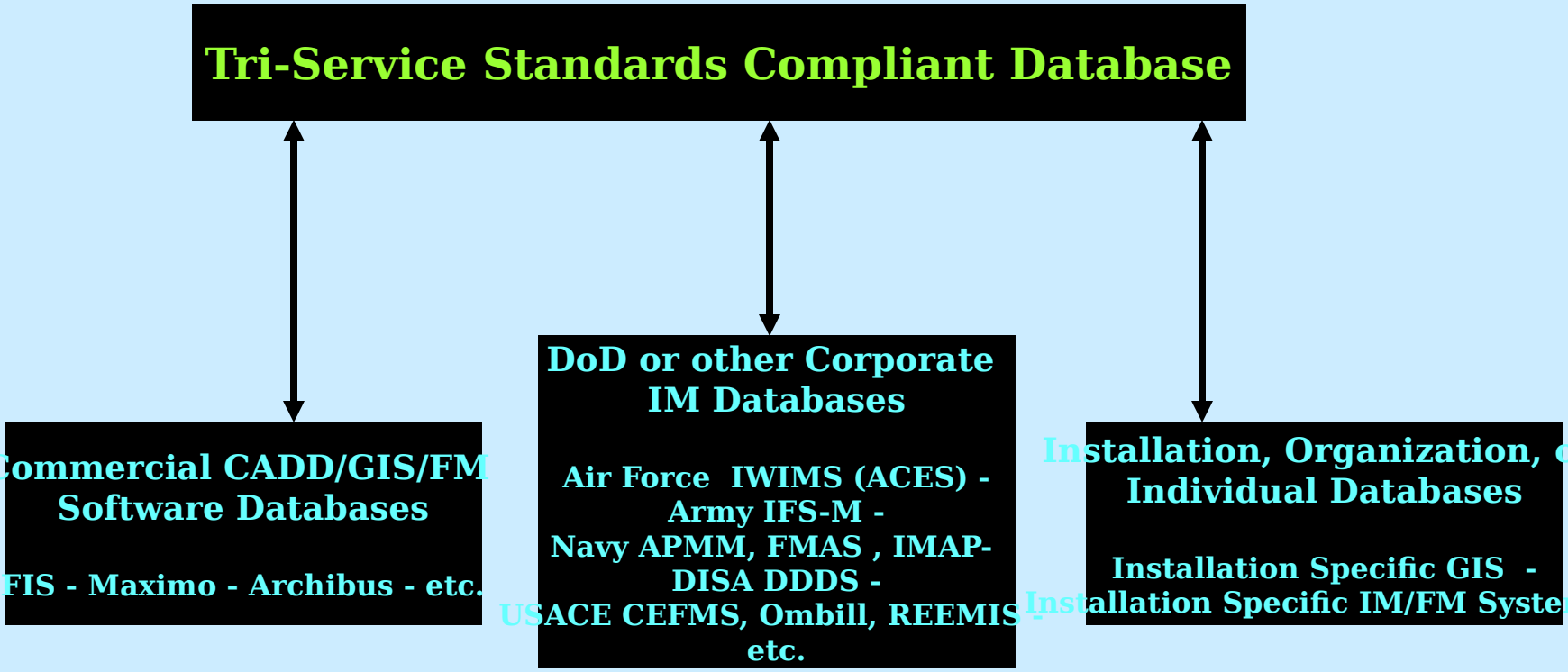
- Entity Sets (25 Themes in TSSDS/TSFMS Release 1.80)

Auditory
Transportation
Boundary
Buildings
Cadastre
Climate
Common
Communications
Cultural
Demographics
Environmental Hazards
Fauna
Flora
Geodesy
Geology
Hydrography
Improvements
Landform
Land Status
Military Operations
Olfactory
Ecology (New)
Soil
Utilities
Visual

Tri-Service CADD/GIS/FM Standards Data Model



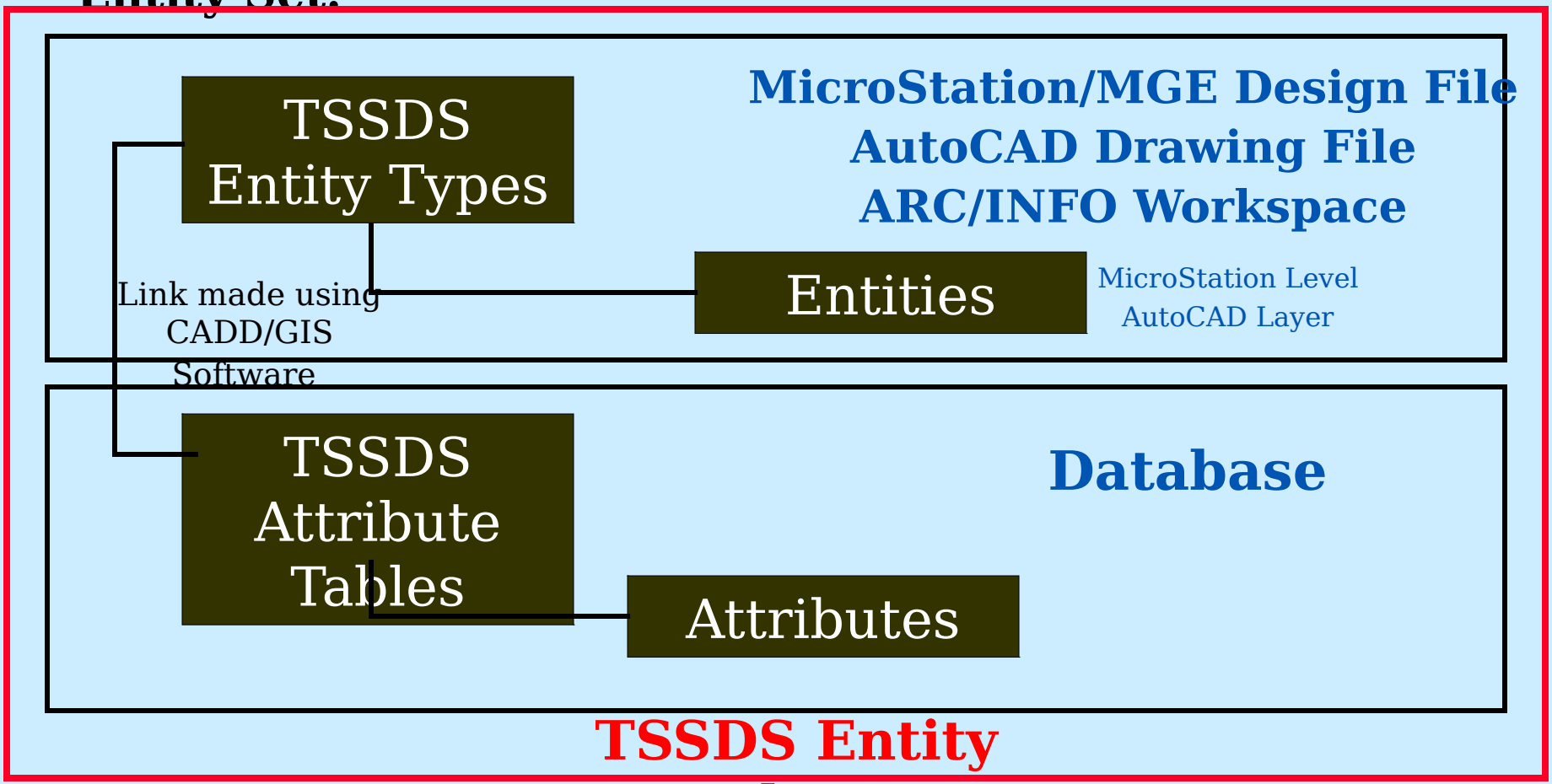
Tri-Service CADD/GIS/FM Standards Data Model



The Tri-Service Data Model will provide the ability to share data

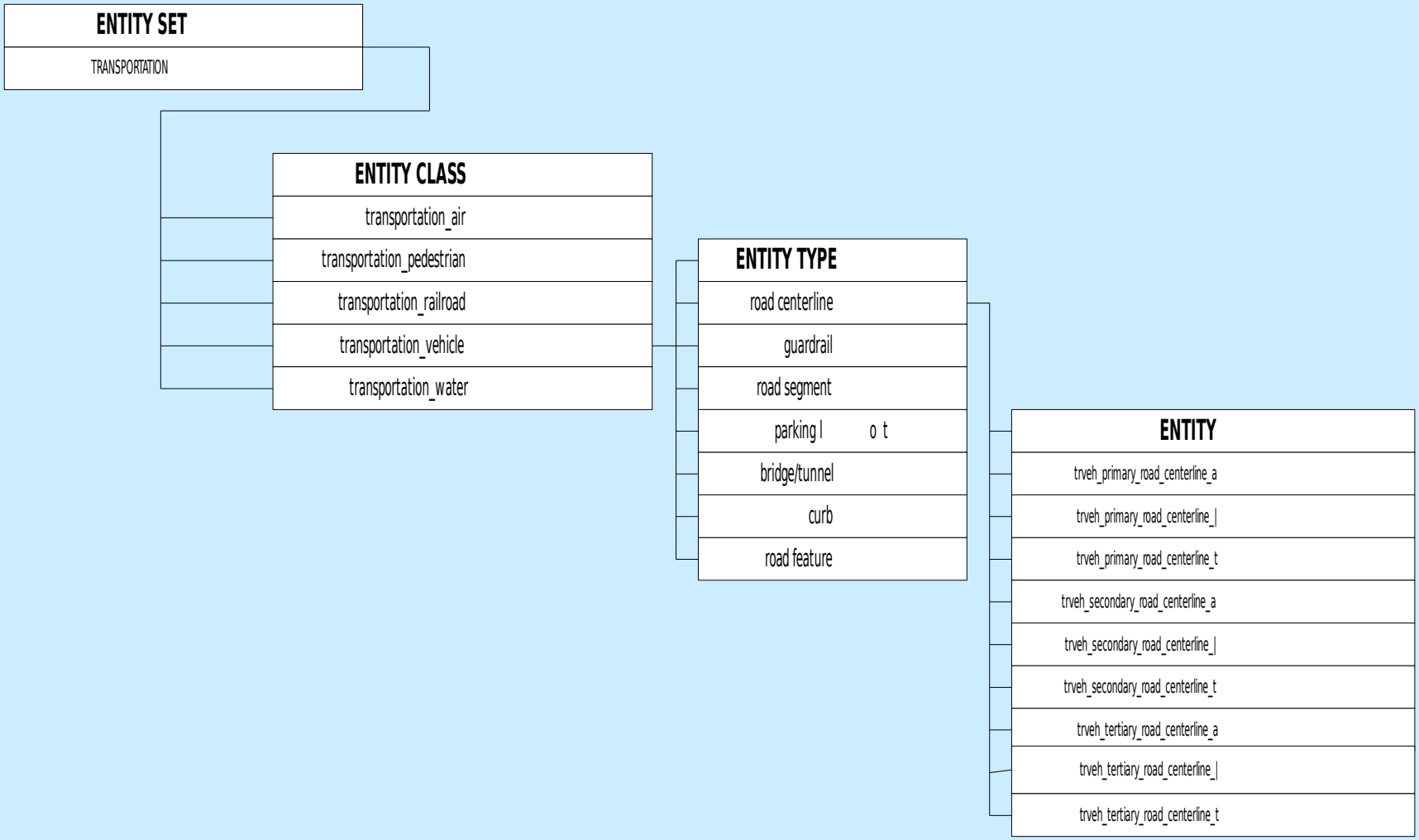
TSSDS Entity Classes

Grouping of geographically referenced (geospatial) features with "attached" Attribute Tables within each Entity Set.



TRI-SERVICE CADD GIS TECHNOLOGY CENTER

Example TSSDS Structu

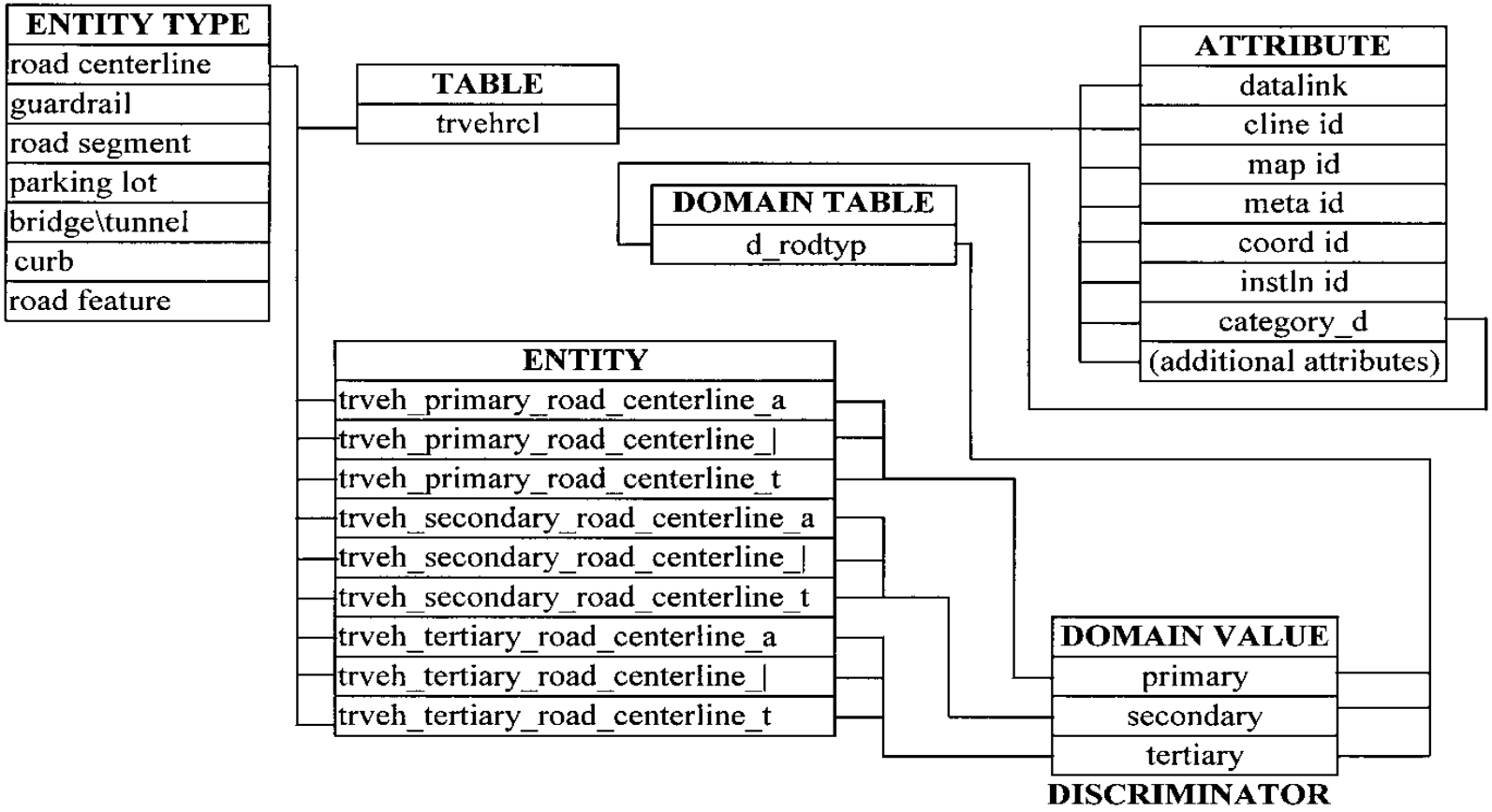


Tri-Service Spatial Data and Facility Management Standards Design Considerations

- **Quality Assurance**
  - Standard Naming Conventions
    - All Coverage and Map File, Attribute Table, and Entity Names Based on Entity Set and Entity Class
    - ‘8.3’ File Name Format for Tables, Maps, and Coverages
      - Optimizes Delivery on Multiple Platforms
    - File Naming Supports Tiling and Temporal Archiving.
    - Uppercase Domain Values Improve Query Quality and Consistency.
    - Normalized Naming Supports Batch Processing in Multiple OS Environments.
    - Primary and Foreign Keys have 20 character field length.
    - Domain values have 16 character field length.

TRI-SERVICE CADD/GIS TECHNOLOGY CENTER

Example TSSDS Structure



TSSDS Entity Classes

- General logical grouping of features within an Entity Set for data management purposes.

- Each entity class will be a separate map or drawing file and corresponds to the following terms:
  - GRASS (CERL): mapset
  - MGE (Intergraph): category or design file
  - ARC/INFO (ESRI): workspace
  - MicroStation (Bentley): design file
  - AutoCAD (Autodesk): drawing file

TSSDS Entity Classes

- Since each entity class corresponds to a map file, it can contain up 63 CADD layers (levels).
  - The TSSDS is designed to be CADD/GIS platform independent, which means the standards are designed to work with the most limiting of the predominant commercially available CADD/GIS platforms which will be used.
  - MicroStation accepts up to 63 layers per map file.
  - AutoCAD accepts an unlimited number of layers.

TSSDS Entity Types

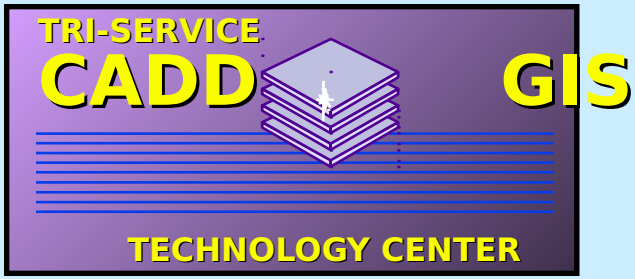
- Entity Type - The logical name of a type or object that can be graphically depicted on a map or drawing.
- Entity Types - Grouping or collection of like Items (entities) that appear graphically on a map or drawing.
- Grouped within each Entity Class.
- Each entity type has a corresponding attribute table (i.e., database table containing information concerning the entity type).

TSSDS Entities

- Items (features) which appear graphically on a map or drawing. An Entity can be represented as a:
  - Boundary (G/GT Polygon) - The line string which outlines the perimeter of an area.
  - Point - A single point representing the geographical location of a feature.
  - String/Chain - A line.

TSSDS Entities

- The TSSDS specifies:
  - Line styles/types for boundary and string/chain entities.
  - Level/layer assignments for all entity feature types.
  - Text size, font, and placement.
  - Colors.
  - Symbol libraries.

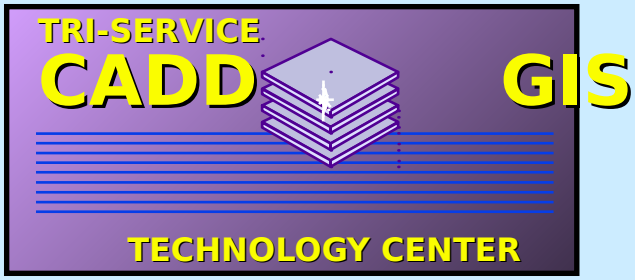


TSSDS/TSFMS ATTRIBUTE TABLE

- A relational database table containing non-graphic information, or attribute data.

- **TSSDS** - A “Graphic” attribute table is linked to a graphic entity (feature), and contains data describing the graphic entity, along with other data and relationships required for geospatial and relational analysis.

- **TSFMS** - A “Nongraphic” attribute table contains data required for a “business process”, event, or function, along with data and and relationships which may be queried for geospatial and relational analysis.

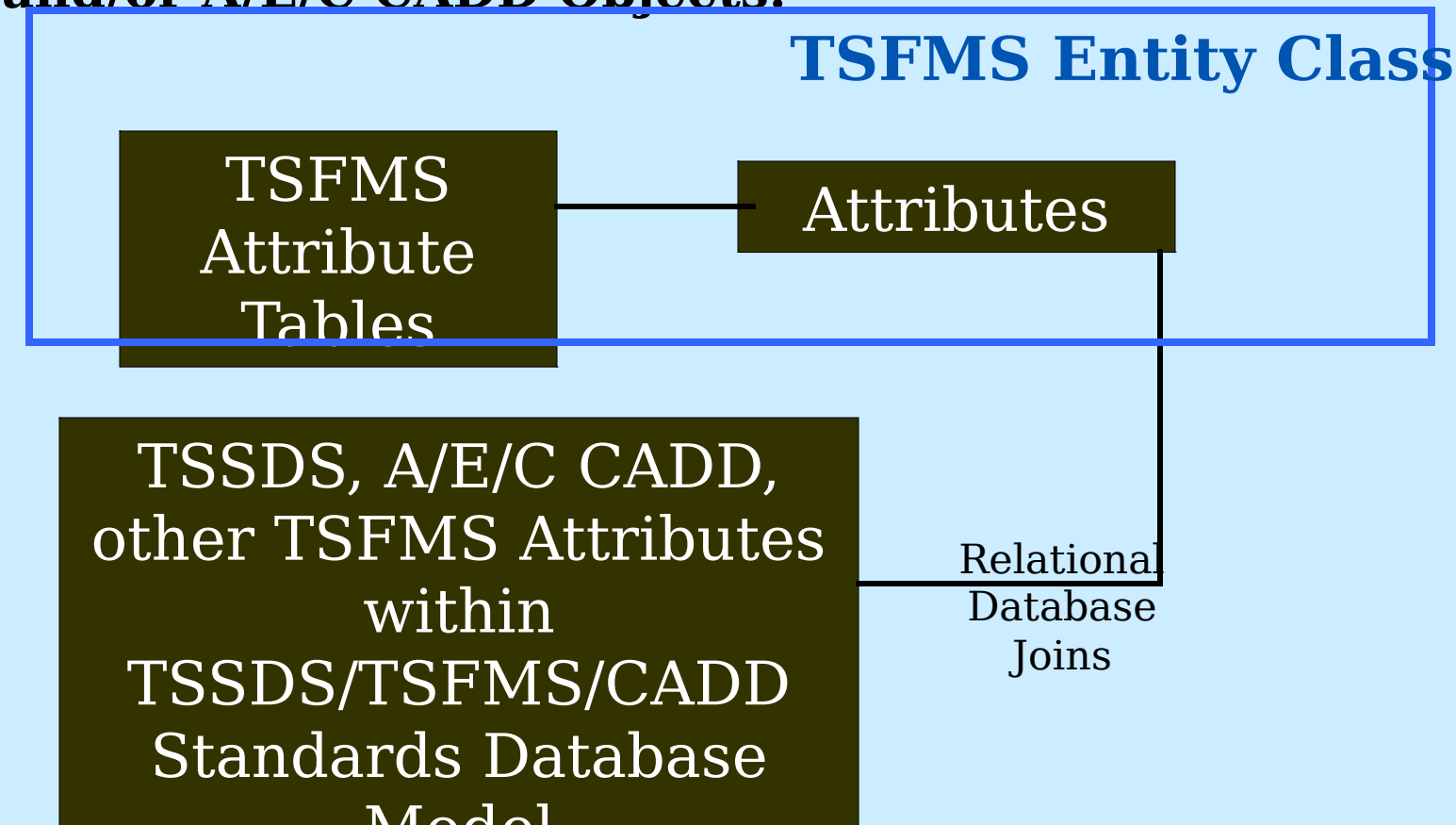


DOMAIN TABLES

- Contains lists of permissible values for specific attributes.
- Provides a finite set of “valid” or “allowable” values, and may be enlarged as necessary.
- Includes units of measure, materials, methods, dispositions, classes, status, phase, etc.

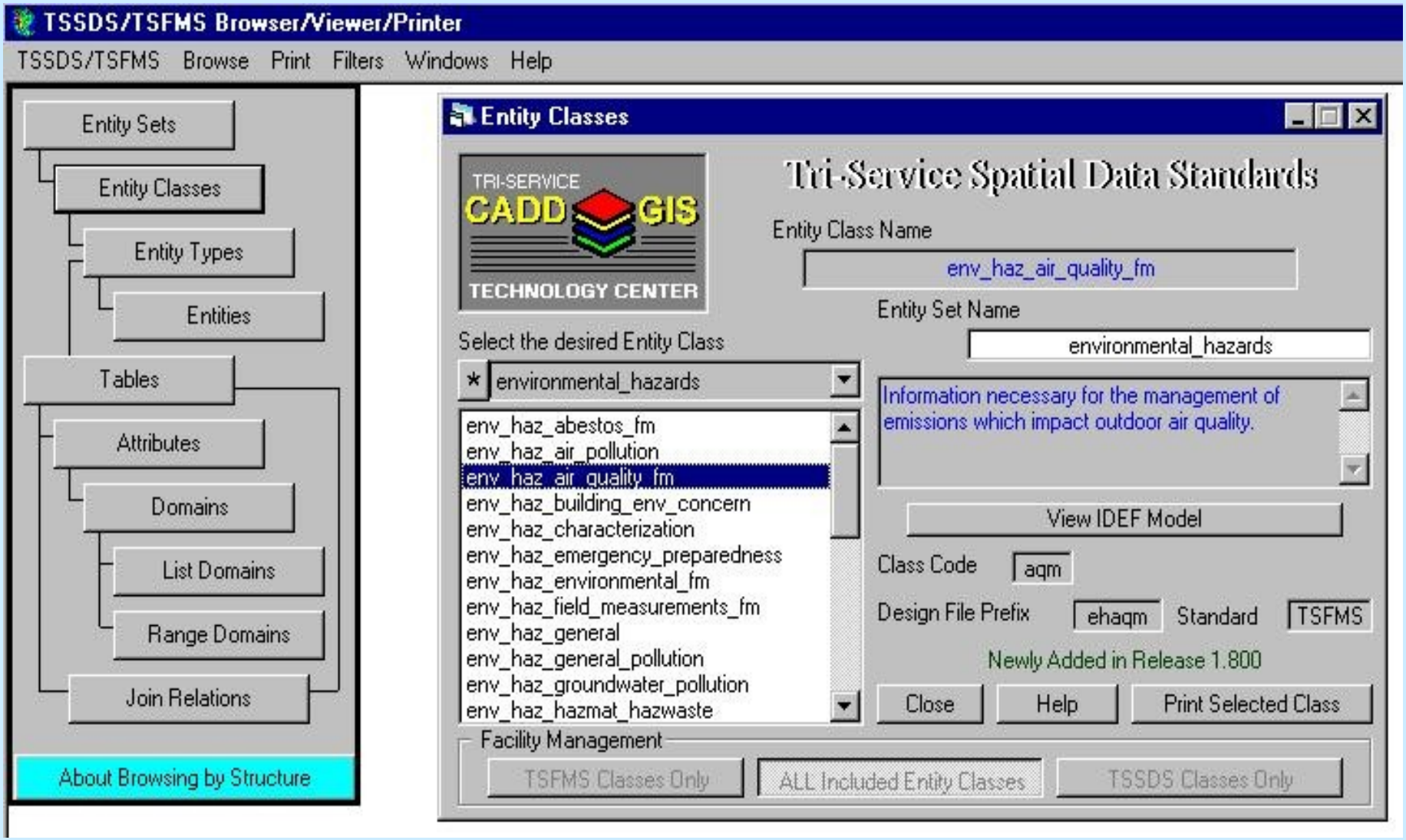
TSFMS Entity Classes

Grouping of related facility management Attribute Tables within each Entity Set. The FM Attribute Tables "business" and event (e.g., inspections, repairs) data related to TSSDS geospatial features and/or A/E/C CADD Objects.

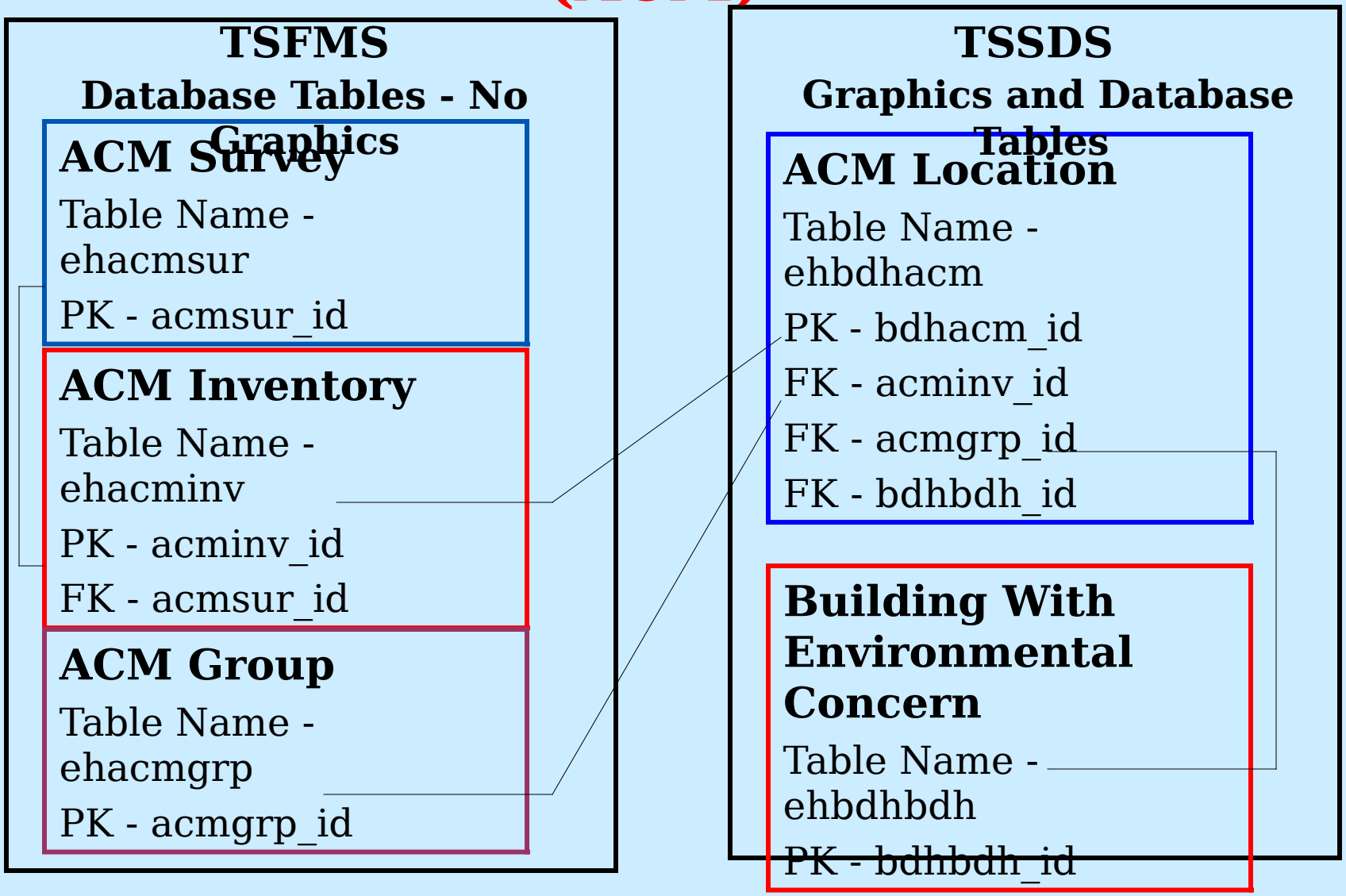


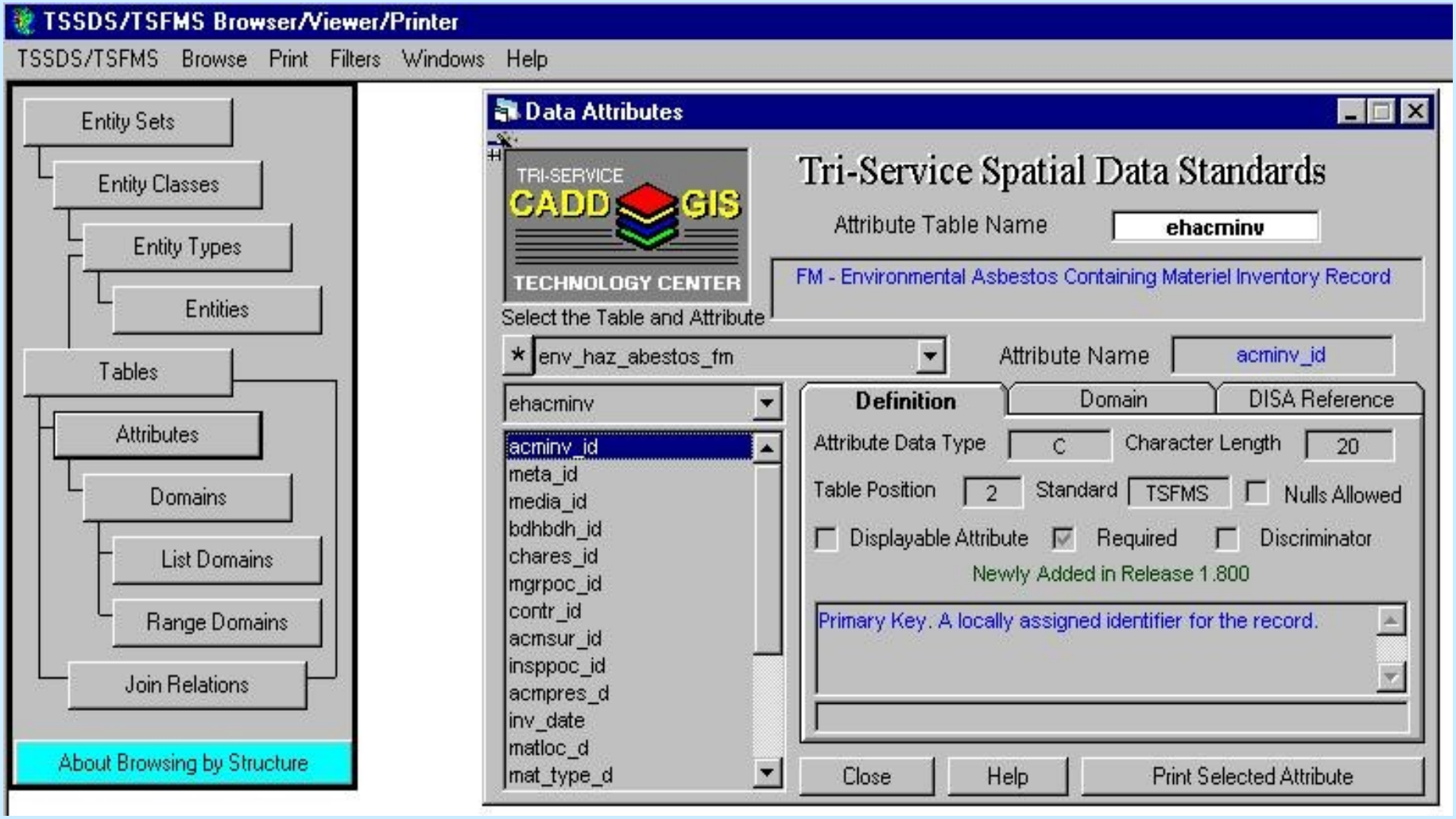
TSSDS/TSFMS Release 1.8
Environmental Hazards Entity Set
Entity Classes

TSSDS	TSFMS
Air Pollution	Asbestos Containing Material Abatement
Building Environmental Concerns	Outdoor Air Quality Management
Characterization	Hazardous Materiel Management
Environmental Emergency Preparedness	Hazardous Waste Management
General	Indoor Air Quality Management
Groundwater Pollution	Lead Based Paint Abatement
Contained Hazardous Materiel/Hazardous Waste	Contained PCB Management
Contained Munitions Materiel/ Munitions Waste	Regulated Storage Tank Management
Munitions Remediation	Surface Water Quality Management
General Pollution	Environmental Field Measurements
Environmental Remediation	Environmental Remediation Management
Sediment Pollution	Environmental Management
Sites	
Soil Pollution	
Solid Waste	
Surface Water Pollution	
Regulated Tanks	


TSSDS/TSFMS Browser/Viewer/Printer
TSSDS/TSFMS Browse Print Filters Windows Help
Entity Sets
Entity Classes
Entity Types
Entities
Tables
Attributes
Domains
List Domains
Range Domains
Join Relations
About Browsing by Structure
Entity Classes
TRI-SERVICE CADD GIS TECHNOLOGY CENTER
Tri-Service Spatial Data Standards
Entity Class Name
env_haz_air_quality_fm
Entity Set Name
environmental_hazards
Select the desired Entity Class
* environmental_hazards
env_haz_abestos_fm
env_haz_air_pollution
env_haz_air_quality_fm
env_haz_building_env_concern
env_haz_characterization
env_haz_emergency_preparedness
env_haz_environmental_fm
env_haz_field_measurements_fm
env_haz_general
env_haz_general_pollution
env_haz_groundwater_pollution
env_haz_hazmat_hazwaste
Information necessary for the management of emissions which impact outdoor air quality.
View IDEF Model
Class Code aqm
Design File Prefix ehaqm Standard TSFMS
Newly Added in Release 1.800
Close Help Print Selected Class
Facility Management
TSFMS Classes Only
ALL Included Entity Classes
TSSDS Classes Only

TSSDS/TSFMS Release 1.8 - Asbestos Containing Material (ACM)




TSSDS/TSFMS Browser/Viewer/Printer
TSSDS/TSFMS
Browse
Print
Filters
Windows
Help
Entity Sets
Entity Classes
Entity Types
Entities
Tables
Attributes
Domains
List Domains
Range Domains
Join Relations
About Browsing by Structure
Data Attributes
TRI-SERVICE
CADD GIS
TECHNOLOGY CENTER
Tri-Service Spatial Data Standards
Attribute Table Name
ehacminv
FM - Environmental Asbestos Containing Materiel Inventory Record
Select the Table and Attribute
*
env_haz_abestos_fm
Attribute Name
acminv_id
ehacminv
acminv_id
meta_id
media_id
bdhbdh_id
chares_id
mgrpoc_id
contr_id
acmsur_id
insppoc_id
acmpres_d
inv_date
matloc_d
mat_type_d
Definition
Domain
DISA Reference
Attribute Data Type
C
Character Length
20
Table Position
2
Standard
TSFMS
Nulls Allowed
Displayable Attribute
Required
Discriminator
Newly Added in Release 1.800
Primary Key. A locally assigned identifier for the record.
Close
Help
Print Selected Attribute

DoD Directive 8320.1

- Designated DISA as lead agency responsible for executing a standardized information management system data policy with DoD, development of procedures for development and approval of standardized data, and making available DoD Data Standards to DoD community.
- Defense Data Dictionary System (DDDS) is DISA’s repository of approved data standard elements.

Some DISA DDDS Integration Issues

- The process used by DISA to add approved data elements to the DDDS is slow.
- DISA has been slow to finalize the DESCIM data models and incorporate approved data elements into the DDDS.
- The data models developed by DISA for development of the DDDS are “logical” models. The IDEF data models developed and distributed with each TSSDS Release are “Physical” models. DISA will not accept data elements from TSSDS without development of “logical” models, an expensive and time consuming process.
- The DISA data models are incomplete in that all data elements have not been approved.
- In order to be DOS and dBase compatible, TSSDS attribute names have a field length of 10. DDDS data element names are 18 characters long.
- DDDS domain values are usually either numeric or 2 - 3 characters in length, and may not reflect a full set of values. TSSDS domain values can be up to 16 characters in length, and usually reflect a more extensive set of values.
- DISA date fields are inconsistent. They may be integers, characters, or range domains. All date fields are the same in TSSDS/TSFMS.
- DISA does not have approved data elements for many important attributes, e.g., point-of-contact phone number, fax number, etc.

TSFMS Issues

- What is Facility Management?
- What should be included in the Tri-Service Facility Management Standards?
  - All Facility Management?
  - Views/Summary Tables intended to interface and share data with Corporate Databases, the TSSDS, A/E/C CADD Standards, and Commercial FM Software?
- How should Facility Management be Integrated with Tri-Service Standards?
  - Incorporate within TSSDS Data Model? - Currently being done.
  - Use/Develop Different Data Model still integrated with TSSDS & A/E/C CADD Standards? If so, which data model should be used?

TSFMS Issues

- What Do the Tri-Service Center's Customers Want?
  - A stable standard that protects their data investment.
  - If standard changes dramatically they may not be able to afford it.